

DP-309380

## CLAIMS

What is claimed is:

1. An exhaust system for a vehicle having an internal combustion engine with a plurality of cylinders, comprising:
  - a exhaust manifold for providing fluid communication of exhaust of the plurality of cylinders to a catalytic converter, said exhaust manifold comprising a first exhaust pipe portion and a second exhaust pipe portion, said first exhaust pipe portion being in fluid communication with said second exhaust pipe portion and said second exhaust pipe portion being in fluid communication with said catalytic converter, said first exhaust pipe portion providing a first fluid path for exhaust of a first plurality of cylinders of the engine and said second exhaust pipe portion providing a second fluid path for exhaust of a second plurality of cylinders of the engine, said second fluid path being shorter than said first fluid path; and
  - a controller for determining whether to deactivate said first plurality of cylinders in accordance with a predetermined engine starting condition, wherein deactivation of said first plurality of cylinders causes said second plurality of cylinders to operate at a condition corresponding to an engine output demand, wherein an exhaust of a first temperature is expelled by said second plurality of cylinders into said catalytic converter, said first temperature being greater than an exhaust temperature that would be generated by said first and said second plurality of cylinders operating at said condition corresponding to said engine output demand.
2. The exhaust system as in claim 1, wherein said first plurality of cylinders and said second plurality of cylinders are on opposite sides of the engine.

DP-309380

3. The exhaust system as in claim 1, wherein said first plurality of cylinders and said second plurality of cylinders are on the same side of the engine.
4. The exhaust system as in claim 3, wherein said first plurality of cylinders are located at a forward end of the vehicle.
5. The exhaust system as in claim 1, wherein said controller receives input signals from a plurality of sensors in order to determine if the engine is being started in said predetermined engine starting condition.
6. The exhaust system as in claim 5, wherein said predetermined engine starting condition is a "cold start" of the engine.
7. The exhaust system as in claim 6, wherein said plurality of sensors provide signals indicative of operating parameters including any combination of the following: catalyst temperature, engine coolant temperature, engine speed, engine load, engine temperature, intake valve position, exhaust valve position and exhaust oxygen sensor temperature measurements, to said controller.
8. The exhaust system as in claim 1, wherein said controller deactivates said predetermined cylinders by sending control signals to actuators configured and positioned to retard the movement of intake and exhaust valves of said plurality of cylinders, wherein said control signals cause said predetermined cylinders to be deactivated by closing intake and exhaust valves of said predetermined cylinders.

DP-309380

9. The exhaust system as in claim 8, wherein air is periodically allowed into combustion chambers of said predetermined cylinders during a cranking event, or during operation of the engine and the air is compressed in said predetermined cylinders when the engine is running.

10. The exhaust system as in claim 9, wherein said intake and exhaust valves of said predetermined cylinders are manipulated by signals generated by said controller in order to allow the air into the combustion chambers of said predetermined cylinders.

11. The exhaust system as in claim 1, wherein said engine output demand corresponds to a "cold start" of the engine, or any start where the catalytic converter catalyst is below a minimum operating temperature.

12. An exhaust system for a vehicle having an internal combustion engine with a plurality of cylinders, comprising:

a pair of exhaust manifolds each providing fluid communication of exhaust of a plurality of cylinders to a catalytic converter, each of said pair of exhaust manifolds comprising a first exhaust pipe portion and a second exhaust pipe portion, said first exhaust pipe portion being in fluid communication with said second exhaust pipe portion and said second exhaust pipe portion being in fluid communication with said catalytic converter, said first exhaust pipe portion providing a first fluid path for exhaust of a first plurality of cylinders of the engine and said second exhaust pipe portion providing a second fluid path for exhaust of a second plurality of cylinders of the engine, said second fluid path being shorter than said first fluid path; and

a controller for determining whether to deactivate predetermined cylinders of said first plurality of cylinders and predetermined cylinders of said second plurality of cylinders in accordance with a predetermined engine starting

DP-309380

condition, wherein deactivation of said predetermined cylinders of said first plurality of cylinders and said predetermined cylinders of said second plurality of cylinders causes the remaining active cylinders of said first plurality of cylinders and said second plurality of cylinders to operate at a condition corresponding to an engine output demand, wherein an exhaust of a first temperature is expelled by said remaining active cylinders of said first plurality of cylinders and said second plurality of cylinders into said catalytic converters of said first exhaust portion and said second exhaust portion, said first temperature being greater than an exhaust temperature that would be generated by said all of said first and said second plurality of cylinders operating at said condition corresponding to said engine output demand.

13. The exhaust system as in claim 12, wherein said controller receives input signals from a plurality of sensors in order to determine if the engine is being started in said predetermined engine starting condition.

14. The exhaust system as in claim 13, wherein said predetermined engine starting condition is a "cold start" or a warm start of the engine and wherein said controller deactivates said predetermined cylinders by sending control signals to actuators configured and positioned to retard the movement of intake and exhaust valves of said plurality of cylinders, wherein said control signals cause said predetermined cylinders to be deactivated by closing intake and exhaust valves of said predetermined cylinders.

15. The exhaust system as in claim 14, wherein air is allowed into combustion chambers of said predetermined cylinders during a cranking event, and/or after start-up of the engine and the air is compressed in said predetermined cylinders when the engine is running and wherein said intake and exhaust valves of said predetermined cylinders are manipulated by signals

DP-309380

generated by said controller in order to periodically allow the air into the combustion chambers of said predetermined cylinders.

16. The exhaust system as in claim 15, wherein a plurality of sensors provide signals indicative of catalyst temperature, engine coolant temperature, engine speed, engine load, engine temperature, intake valve position, exhaust valve position and exhaust oxygen sensor temperature to said controller.

17. An exhaust system for a vehicle having an internal combustion engine with a plurality of cylinders, comprising:

a pair of exhaust manifolds each providing fluid communication of exhaust of a plurality of cylinders to a single catalytic converter, each of said pair of exhaust manifolds comprising a first exhaust pipe portion and a second exhaust pipe portion, said first exhaust pipe portion being in fluid communication with said second exhaust pipe portion and said second exhaust pipe portion being in fluid communication with said catalytic converter, said first exhaust pipe portion providing a first fluid path for exhaust of a first plurality of said plurality of cylinders of the engine and said second exhaust pipe portion providing a second fluid path for exhaust of a second plurality of said plurality of cylinders of the engine, said second fluid path being shorter than said first fluid path;

a warm up converter disposed between said single catalytic converter and one of said pair of said exhaust manifolds wherein the other one of said pair of said exhaust manifolds provides fluid communication to said single catalytic converter without passing through said warm up converter; and

a controller for determining whether to deactivate predetermined cylinders of said plurality of cylinders, in accordance with a predetermined engine starting condition, said predetermined cylinders being in fluid communication with said catalytic converter, wherein deactivation of said

DP-309380

predetermined cylinders of said plurality of cylinders causes the remaining active cylinders of said plurality of cylinders to operate at a condition corresponding to an engine output demand, wherein an exhaust of a first temperature is expelled by said remaining active cylinders of said plurality of cylinders into said warm up converter, said first temperature being greater than an exhaust temperature that would be generated by all plurality of cylinders operating at said condition corresponding to said engine output demand.

18. The exhaust system as in claim 17, wherein said controller receives input signals from a plurality of sensors in order to determine if the engine is being started in said predetermined engine starting condition.

19. The exhaust system as in claim 18, wherein said predetermined engine starting condition is a "cold start" of the engine or a warm start when the controller indicates the catalyst temperature is below minimum operating temperature and wherein said controller deactivates said predetermined cylinders by sending control signals to actuators configured and positioned to retard the movement of intake and exhaust valves of said plurality of cylinders, wherein said control signals cause said predetermined cylinders to be deactivated by closing intake and exhaust valves of said predetermined cylinders.

20. The exhaust system as in claim 17, further comprising another warm up converter disposed between said single catalytic converter and the other one of said pair of said exhaust manifolds, wherein said controller determines whether to deactivate predetermined cylinders, in accordance with the operating temperature of said warm up converter.

DP-309380

21. The exhaust system as in claim 20, wherein a plurality of sensors provide signals indicative of catalyst temperature, engine coolant temperature, engine speed, engine load, engine temperature, intake valve position, exhaust valve position and exhaust oxygen sensor temperature to said controller.

22. The exhaust system as in claim 17, wherein said controller further comprises an algorithm for activating said predetermined cylinders and deactivating the remaining cylinders when said catalytic converter has reached an effective operating temperature and engine operating load, wherein the exposure of said warm up converter to the engine exhaust is minimized.

23. A method for reducing exhaust emissions of an engine having a plurality cylinders each having exhaust ports coupled to an exhaust system having a catalytic converter, the method comprising:

- determining a first plurality and a second plurality of said plurality of cylinders, said first plurality of cylinders having a longer exhaust path to said catalytic converter than said second plurality of cylinders;

- determining if the engine is being started from a cold state by sampling at least the temperature of the engine to indicate if the catalytic converter disposed in the exhaust system is below operating temperature;

- deactivating said first plurality of cylinders if the engine is being started from a cold state;

- supplying additional fuel to said second plurality of cylinders, wherein deactivation of said first plurality cylinders causes said second plurality of cylinders to operate at a condition corresponding to an engine output demand, wherein an exhaust of a first temperature is expelled by said second plurality of cylinders into said warm up converter, said first temperature being greater than an exhaust temperature that would be generated by all plurality of cylinders operating at said condition corresponding to said engine output demand.

DP-309380

24. A medium encoded with a machine-readable computer program code for periodically reducing exhaust emissions of an engine having a plurality of cylinders each having exhaust ports coupled to an exhaust system having a catalytic converter, said medium including instructions for implementing the method comprising:

determining if the engine is being started from a cold state by sampling at least the temperature of the engine to indicate if the catalytic converter disposed in the exhaust system is below operating temperature;

deactivating a first plurality of a plurality of cylinders of the engine, said first plurality of cylinders having a longer exhaust path to said catalytic converter than a second plurality of cylinders, if the engine is being started from a cold state;

supplying additional fuel to said second plurality of cylinders, wherein deactivation of said first plurality of cylinders causes said second plurality of cylinders to operate at a condition corresponding to an engine output demand, wherein an exhaust of a first temperature is expelled by said second plurality of cylinders into said warm up converter, said first temperature being greater than an exhaust temperature that would be generated by all plurality of cylinders operating at said condition corresponding to said engine output demand.

25. The medium of claim 23, wherein the method further comprises:  
determining if the catalytic converter is at a predetermined operating temperature.